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EVALUATION OF PITCH CANKER DISEASE IN LOBLOLLY PINE FOLLOWING AN OUTBREAK OF NEEDLE SHEATH MIDGE AT THE STUART SEED ORCHARD, POLLOCK, LOUISIANA 1984

by

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Abstract

A 20 percent survey of the Texas loblolly geographical seed source revealed a 40 percent incidence of pitch canker and an average number of shoots killed of 2.8 per ramet in 1984. Damage was not different from that estimated for 1983. There was little association between the most and and least damage clones by each pest. Therefore, midge damage did not contribute to an increase in pitch canker. A final survey is recommended for next spring to insure that any increase in pitch canker will be detected.

INTRODUCTION

Pitch canker (PC) of southern pines, caused by the fungus Fusarium moniliforme Sheld var. subglutinans Wr. and Reink. (FMS) is an intermittently damaging disease of forest stands (Blakeslee and Oak 1979, Phelps and Chellman 1976), seed orchards (Dwinell and others 1977, Phelps and Chellman 1976) and forest nurseries (Barnard and Blakeslee 1980). Potential to damage flowers, cones, and seed has been demonstrated for slash and loblolly pines (Miller and Bramlett 1979).

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Many species of southern pine are susceptible to FMS infection. Shortleaf, slash and Virginia pine are highly susceptible. Loblolly is less susceptible (Dwinell 1978). The fungus enters the tree through wounds and can be vectored by insects (Blakeslee et al. 1980).

Effects of PC outbreaks in southern pine seed orchards are not yet fully understood. In addition to shoot damage, reduced cone/seed production has been reported by some (Dwinell and others 1977), while bumper cone crops have occurred during a PC outbreak (Kuhlman and others 1982).

Clonal variation in susceptibility is known to exist in loblolly pine (Kuhlman and others 1982; Kelly and Williams 1982) and slash pine (Phelps and Chellman 1976).

Needle droop and defoliation of loblolly pine, Pinus taeda L., caused by a needle sheath midge (Contarinia sp.) was first detected in September, 1971, at the USDA-FS Erambert Seed Orchard, Brooklyn, Mississippi (Overgaard et al. 1976). This infestation declined during the subsequent years and by 1976 little defoliation was observed. Since 1976, loblolly defoliation caused by midge feeding has not been reported.

In early August 1983, seed orchard personnel at the USDA-FS Stuart Seed Orchard, Pollock, Louisiana, noticed wilting of many of the loblolly trees. By August 17 the condition had worsened and Forest Pest Management (FPM) was contacted. It was determined that the needle droop and defoliation was caused by midges feeding on the needle tissue within the fascicle sheath. The damaged areas become visible after the needles elongate. A 20% survey of the Texas loblolly seed source (Weatherby et al. 1983) revealed that 84% of the ramets were affected and only 5 clones expressed any resistance. Observations in Florida indicate that PC outbreaks often follow heavy infestations of a similar midge (Weatherby et al. 1983).

The purpose of this evaluation is to determine the incidence and severity of PC in the year following an outbreak of needle sheath midge.

METHODS

A 20% survey of the Texas loblolly geographical seed source block was made in June, 1984 by examining each tree in every 5th row. These trees and rows were previously rated for pine needle midge damage (Weatherby et al. 1983). Each ramet was examined jointly by two observers. Pitch canker was recorded by counting the old (1983) and new (1984) shoots which were damaged. Binoculars were used as necessary to confirm the presence of a canker. Thirty-two newly damaged tips (1984) were sampled from 12 ramets for laboratory isolation of F. moniliforme var. subglutinans. Seven laterals with old damage (1983) were sampled from 4 ramets to confirm the presence of a canker but no attempt was made to isolate the pathogen from old, dry cankers.

RESULTS

Incidence (% of ramets infected) and the mean number of branch tips killed in 1983 and 1984 are summarized by clone in Table 1. Overall disease

Table 1. Incidence (% of trees infested) of and mean number of tips killed by pitch canker in 1983 and 1984, Texas loblolly, Stuart Seed Orchard.

Clone	No. Ramets Observed	Old (1983) Damage		New (1984) Damage	
		Incidence	$\bar{x}$ Tips	Incidence	$\bar{x}$ Tips
1	20	25	1.80	40	1.50
2	13	69	1.44	38	1.40
3	15	27	1.00	40	2.17
4	17	35	1.50	41	2.00
5	7	71	2.80	57	1.00
6	16	38	2.33	75	1.92
7	19	16	2.33	63	1.92
8	16	13	1.00	13	1.00
9	11	27	1.33	36	1.50
10	16	81	3.08	44	2.00
11	15	40	1.83	7	2.00
12	14	36	2.60	43	1.83
13	13	0	0.00	15	1.00
14	19	21	1.00	16	1.00
15	17	29	1.00	35	1.50
16	13	69	1.78	62	1.00
17	24	33	2.75	96	10.00
18	8	38	4.67	25	1.50
19	14	36	2.80	79	4.91
20	11	55	5.00	18	1.50
21	19	42	1.75	32	2.00
22	13	62	1.75	69	2.22
23	11	27	1.33	18	1.00
24	12	17	1.00	33	1.00
25	19	37	2.57	58	1.45
26	12	83	5.70	92	3.55
27	15	33	4.20	33	1.60
28	18	22	1.50	39	1.43
29	21	38	1.75	48	1.80
30	13	62	2.25	31	1.50
31	16	56	1.89	19	1.00
32	12	83	2.70	33	1.50
33	13	62	2.13	62	2.63
34	15	67	2.20	10	1.00
35	12	33	1.00	75	4.00
36	20	58	1.14	10	1.50
37	17	35	2.33	12	1.00
38	8	38	1.67	13	1.00
39	22	27	1.33	18	1.00
40	18	67	2.08	67	2.75
41	13	23	1.67	0	0.00
42	20	75	7.73	30	2.33
43	17	59	2.70	18	1.33
44	9	67	2.33	44	2.75
45	19	21	2.25	16	1.00
46	14	79	3.27	86	6.50
47	17	53	1.78	41	3.00
48	17	6	1.00	18	1.00
49	10	40	2.75	30	4.00
50	14	0	0.00	14	1.00
Mean		40.08	2.59	38.33	2.80

incidence was 40.08% in 1983 (old damage) and 38.33% in 1984 (fresh, new damage). Mean number of branch tips killed rose slightly from 2.59 in 1983 to 2.80 per tree in 1984. Twelve (24%) of the clones had increases in incidence and severity of pitch canker while 18 (36%) of the clones exhibited a decrease. The remaining 40% of the clones showed no significant change. Very few ramets exhibited heavy damage.

A comparison of new (1984) pitch canker damage and midge damage (1983) is presented in Table 2. Midge damage is taken from Weatherby et al. (1983). Within the 10 clones most damaged by each pest, only 2 clones were common; clone 46 and clone 40. Within the 10 clones least damaged by each pest there were 5 clones in common; clone 8, 13, 14, 37, and 50. The comparison of the 10 clones most damaged is repeated in Table 3, however, damage for pitch canker is in order of mean number of tips killed (instead of incidence as in Table 2). The same two clones 46 and 40 were common. The least damaged clones by pitch canker can only by placed in order by incidence since the mean number of tips killed per tree is constant at 1.0 (except for clone 50 where it is 0.0).

Sixteen fresh (1984) cankers were collected for laboratory isolations. Thirteen of these contained the pitch canker fungus. Cankers could not be confirmed on samples of old damage (1983) collected due to the dryness of the material and deterioration caused by secondary insects.

DISCUSSION

The current level of pitch canker in the Texas loblolly seed source is moderate in terms of incidence (38%) and light in terms of damage ($\bar{x}$ of 2.8 tips killed per tree). While a few individual ramets had high numbers of tips killed, most tips lost only the current years growth or 2 years growth. Thus, actual damage to individual trees is not severe.

Since the incidence and damage due to pitch canker in 1984 is very similar to that estimated for 1983, it appears that the midge infestation did not contribute to any increase in pitch canker. Similarly, only 2 clones were common to the 10 most damaged by each pest and only 5 common to the 10 least damaged by each suggesting any association between the pests is minimal.

Overall, it appears that pitch canker, while prevalent, is causing only minimal damage and that the heavy infestation of pine needle midge did not increase incidence or severity of pitch canker to a noticeable degree this season.

Another survey of these same rows is recommended in order to be sure that large amounts of pitch canker do not show up late in the growing season or in the next season.

Table 2. Incidence (% ramets infected) and severity of needle sheath midge and pitch canker, Texas loblolly, Stuart Seed Orchard, 1983 and 1984. Clones listed are the 10 most damaged and 10 least damaged by each pest.

Midge (1983)				Pitch Canker (1984)			
Rank (by % in High)	Clone	Incidence	% High[1/]	Incidence	$\bar{x}$ Tips	Clone	Rank (by $\bar{x}$ Tips)
1	10	100	100	96	10.0	17	1
2	27	100	100	86	6.5	46*	2
3	30	100	100	79	4.9	19	3
4	46*	100	100	75	4.0	35	4
5	25	100	95	30	4.0	49	5
6	34	100	94	92	3.6	26	6
7	18	100	90	41	3.0	47	7
8	29	100	88	67	2.8	40*	8
9	31	100	88	44	2.8	44	8
10	40*	100	88	62	2.6	33	10
41	37*	65	29	18	1.0	48	41
42	15	74	26	16	1.0	14*	42
43	1	62	10	16	1.0	45	43
44	9	73	9	15	1.0	13*	44
45	4	94	0	14	1.0	50*	45
46	14*	37	0	13	1.0	38	46
47	7	44	0	13	1.0	8*	47
48	50*	43	0	12	1.0	37*	48
49	13*	21	0	10	1.0	34	49
50	8*	6	0	0	0.0	41	50

[1/] Percent of observed ramets in high damage category.

* Clones common to the 10 clones most damaged or 10 clones least damaged by each pest.

Table 3. Incidence (% ramets infected) and severity of needle midge and pitch canker on the 10 clones most damaged by each pest, Texas loblolly, Stuart Seed Orchard, 1983 and 1984.

Midge (1983)				Pitch Canker (1984)			
Rank (by % in High)	Clone	Incidence	% High[1/]	Incidence	$\bar{x}$ Tips	Clone	Rank (by Incidence
1	10	100	100	96	10.0	17	1
2	27	100	100	92	3.[illegible]	26	2
3	30	100	100	86	6.5	46*	3
4	46*	100	100	79	4.9	19	4
5	25	100	95	75	1.9	6	5
6	34	100	94	75	4.0	35	6
7	18	100	90	69	2.2	22	7
8	29	100	88	67	2.8	40*	8
9	31	100	88	63	1.9	7	8
10	40*	100	88	62	1.0	16	10

[1/] Percent of observed ramets in high damage category.
* Clone common to the 10 clones most damaged by each pest.

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